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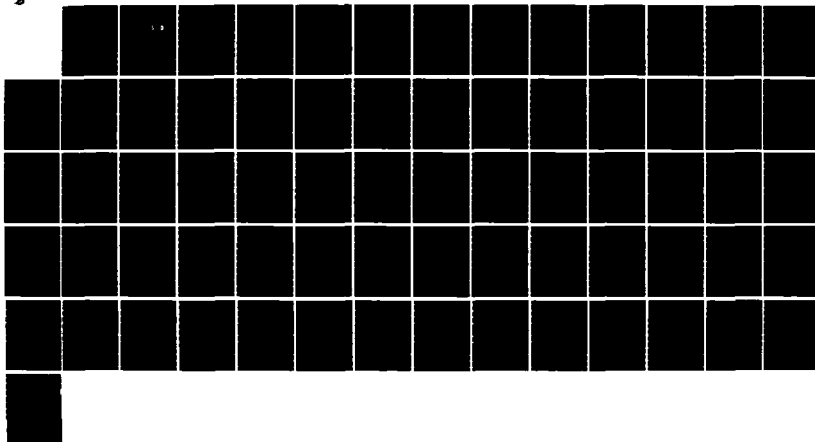
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*A PLOTTING LIBRARY FOR
TEKTRONIX COMPATIBLE DEVICES*

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SCIENTIFIC REPORT NO. 3

8 August 1985

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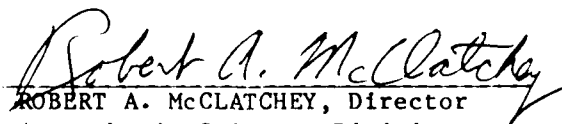
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"This technical report has been reviewed and is approved for publication"


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FOR THE COMMANDER


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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report contains documentation of a plotting library. This library contains FORTRAN callable subroutines that enable the creation of plots on Tektronix compatible terminals. This report includes a discussion of the library, a sample plotting session, and documentation of the routines.			
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I. Introduction

This report documents a plotting library for use with Tektronix terminals and emulators connected to Digital Equipment Company VAX computers using the VMS operating system. The library contains user callable routines that perform graphical manipulation on the screen, draw lines and markers, and contour data.

This work was conducted under contract with the Cloud Physics Branch, Atmospheric Sciences Division, of the Air Force Geophysics Laboratories

The routines in the library have been designed primarily for the Tektronix 4115B. Many of them will work on other terminals, but some, notably the routines that act on colors, the dialog area, and segments, may work only partially or not at all.

The library contains both higher and lower level routines. The higher level routines that are commonly called by user programs do things like contour arrays, draw axes, plot strings of text and change colors and visibilities of objects. Lower level routines control output and data encoding and are usually only called by the higher level routines in the library.

The most likely routines to be called by a high level user program are:

- T_BEG and T_END which must be called to initialize and terminate plotting,
- T_MARK and T_LINEM which plot markers and lines,
- T_BSEG, T_ESEG, T_PSEG, T_TSEG, T_VSEG, T_KSEG which begin, end, move, transform, set visibility, and kill graphical objects called segments,
- T_DACHAR, T_DAIND, T_DALIN, and T_DAPOS which set the dialog area width, color, number of lines, and position,
- T_LCHAR and T_SCHAR which change the dialog area character size,
- T_STRNG which plots a string of text,
- T_PANEL which draws a filled panel,
- T_PRINT which prints the screen,
- T_CONTOUR and T_AXES are powerful contouring and axes labelling routines. T_AXES is documented at the end of the alphabetical documentation

There are many other routines that are used primarily by other members of the library. These are documented here so that new routines that are written and added to the library can use them to do low level actions.

II. Definition of terms

Although familiarity with the Tektronix 4115B is assumed, some terms are defined here because they are used extensively throughout this documentation. If extensive use is made of the 4115, the 4110 Command Reference Manual, the 4115B Operators and Host Manuals should be consulted. The Command Reference Manual contains a comprehensive list of all valid commands as well as lists of colors, line styles, marker types, and panel fill patterns.

Dialog area: This is a plane that "floats" over the graphics on the screen. Data, output, and commands can be written to this plane without interfering with the graphics below.

Segments: A segment is a series of graphics commands or "primitives" that can be stored and manipulated as a whole.

Marker: This is a symbol like a plus sign, a diamond or a point. A list is contained in the 4110 Command Reference Manual

Panel: This is a polygon filled with a pattern or color. Patterns and colors are detailed in the 4100 Command Reference Manual

Alpha mode: In this mode, output is directed to the dialog area.

Vector mode: In this mode, output is directed to the graphics area.

III. Operating procedures

To use this plotting library, a program must be linked with the library, which now resides at DRA3:[WURMAN.TEK]TEKLIB.OLB. All routines and common blocks in this library have names that begin with the letters "T_". Thus, in order to eliminate naming conflicts, it is recommended that user routines and common blocks avoid names beginning with that sequence. Before running the program, the logical name PLOTIO must be defined. The definition of PLOTIO determines whether plots are sent to a file or to the screen. (But, note that the file output option is not fully functional in the current version of this library.) This is usually done with one of the following commands:

```
DEFINE PLOTIO TT          to send plots to the screen
or
DEFINE PLOTIO PLOT.DAT    to send plots to a file
```

The first plotting routine called must be T_BEG and the last routine called must be T_END. It is not necessary to fully understand what they do, (they are discussed in the documentation) but, failure to call these routines may cause program execution to halt.

The terminal should be in alpha mode before any output is sent to the dialog area. Most commonly called library routines leave the terminal in that mode, but some of the lower level ones such as T_VECT and T_OUT do not.

V. Documentation of Routines

The following pages contain a description of all routines in the library, with the exception of T_AXES (documented last, on page 65), in alphabetical order.

TYPE: SUBROUTINE

NAME: T_ALPHA

PURPOSE: To set a Tektronix terminal to alpha mode

DESCRIPTION: This subroutine will set a Tektronix terminal to alpha mode. The terminal mode is changed immediately.

CALLING SEQUENCE: CALL T_ALPHA

INPUT: none

OUTPUT: Calls T_OUT to send appropriate sequence to terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: All pending plotting output being stored by T_OUT will be sent to the terminal.

RESTRICTIONS: none

METHOD: An ASCII 31 is sent to the terminal with a call to T_OUT. The output is forced to be immediate by using a negative output length specifier.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman
Modified 7-Aug-1985 by Joshua Wurman
sends a -1 length to T_OUT
to force immediate output

TYPE: SUBROUTINE

NAME: T_ALPHAD

PURPOSE: To set a Tektronix terminal to alpha mode without forcing immediate output

DESCRIPTION: This subroutine will set a Tektronix terminal to alpha mode.

CALLING SEQUENCE: CALL T_ALPHAD

INPUT: none

OUTPUT: Calls T_OUT to send appropriate sequence to terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: An ASCII 31 is sent to the terminal with a call to T_OUT.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1985 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_BEG

PURPOSE: Initializes plotting

DESCRIPTION: This subroutine assigns an I/O channel to the terminal or opens a file to receive plotting output and places information in the COMMON BLOCK /T_COMMON_CHAN/ concerning the I/O channel number and the action taken.

If the first two characters of the translation of the logical name PLOTIO are "TT" then an I/O channel is opened to the terminal and plots are sent there. If they equal anything else, then a file with the name of the translation of PLOTIO is opened and plots are sent there.

In addition, information about the action taken above is placed in a common block. This common block is used by other plotting output routines and is described in more detail below.

CALLING SEQUENCE: CALL T_BEG

INPUT: none

OUTPUT: A message indicating the action taken is sent to the terminal.

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: /T_COMMON_CHAN/ contains a two byte integer which contains either the channel number assigned to the terminal or a 50 which is the logical unit number associated with the file that is opened. A third byte contains either a .TRUE. if an I/O channel was opened to the terminal or a .FALSE. if a file was opened.

SIDE EFFECTS: If an error occurs during logical name translation, channel assignment, or file opening, program execution stops.

RESTRICTIONS: Since only the first two characters of the translation of PLOTIO are checked, it is impossible to send plots to a file with a name that starts with "TT...".

METHOD: The system service TRNLOG is called to translate "PLOTIO". If the translation starts with "TT" then the system service ASSIGN is called to assign the first available I/O channel. If the translation begins with anything else, then a file is opened with a LUN=50, CARRIAGECONTROL=LIST and RECL=1600.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY:

Created 7-Nov-1984 by Joshua Wurman
Modified 12-Nov-1984 by Joshua Wurman
Send message to terminal telling
of action
19-Nov-1984 by Joshua Wurman
Opens file if beginning of PLOTIO
is not "TT" places .FALSE. in 3rd
byte of /CHAN/ if file and .TRUE.
if terminal
29-Nov-1984 by Joshua Wurman
Program stops if there is an error
opening the file

TYPE: SUBROUTINE

NAME: T_BHSEG

PURPOSE: Closes the current segment and opens the next higher one

DESCRIPTION: Closes the segment that is currently open and opens the one that is next higher in number.

CALLING SEQUENCE: CALL T_BHSEG

INPUT: none

OUTPUT: Calls T_OUT to send appropriate sequence to terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends the "begin-next-higher-segment" command to the terminal.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_BSEG

PURPOSE: Opens a specified segment

DESCRIPTION: Opens the segment specified in the calling argument

CALLING SEQUENCE: CALL T_BSEG(SEG_NUMBER)

SEG_NUMBER: Integer indicating which segment number
is to be opened

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequence to
terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends "begin segment" command to terminal with appropriate
number code for the segment number by calling T_OUT and
T_INCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_COLM

PURPOSE: Changes an entry in the color map of the terminal

DESCRIPTION: Sets the hue, lightness and saturation of a specified color number to the specified values

CALLING SEQUENCE: CALL T_COLM(COL_NUM, COL_HUE, COL_LIGHT, COL_SAT)

COL_NUM: Integer containing the number of the color to be changed

COL_HUE: Integers containing the hue, lightness, and saturation to be associated with the color number

COL_LIGHT:

COL_SAT:

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: The color specifying mode is changed to HLS.

RESTRICTIONS: none

METHOD: T_OUT and T_INCOD are called to send appropriate sequences to the terminal

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_CONTOUR

PURPOSE: To contour filled data arrays

DESCRIPTION: This routine is a powerful color contouring routine. The caller has extensive control over the contour output. Most of the parameters that are passed to this routine are contained in a control file described below.

CALLING SEQUENCE: CALL T_CONTOUR (FIRST_SEGMENT , X_DIMENSION ,
Y_DIMENSION , EXIT_STATUS)

FIRST_SEGMENT: Integer containing the number of the first segment to be used in the plot. This segment contains the contours. The next higher numbered segment contains the extremum labels, if any.

X_DIMENSION: Integers containing the dimensions of the array to be contoured

Y_DIMENSION:

EXIT_STATUS: Integer that will contain a one if this routine exits successfully or a minus one if there is an error exit

In addition, a subroutine, T_CONTOUR_INOUT, should be linked to the program. This routine is called to allow for boundary criteria to be specified. A sample routine is shown below. This sample will always return a .FALSE. which has no effect on T_CONTOUR. If a .TRUE. is returned, then contours will not be drawn in the grid point specified.

```

C
C Sample T_CONTOUR_INOUT that always returns an in bounds indication
C
C   SUBROUTINE T_CONTOUR_INOUT ( RI , RJ , OUT )
C
C       RI, RJ are four byte floating point numbers which contain a grid
C       point location that corresponds to data gridpoint
C       (RI+1,RJ+1)
C       OUT is a one byte logical value which should be .TRUE. for
C       out of bounds points and .FALSE. for in bounds points.
C
C   LOGICAL OUT
C   OUT=.FALSE.
C
C       This block of code would leave a blank space for a label
C
C       IF (RI.LT.30.AND.RI.GT.20.AND.RJ.LT.30.AND.RJ.GT.20)
C   1 THEN
C       OUT=.TRUE.

```

```

C      ELSE
C      OUT=.FALSE.
C      END IF
C
      RETURN
      END

```

INPUT: Most parameters for the plot are read from the file with the logical name CONTOURCTL which should be defined prior to calling this routine. This can be done with a command like, DEFINE CONTOURCTL CONTROL.DAT. The file should have carriage return record attributes (which is what EDT creates). All the data in the file (except for one number) has a format of IS, F11.4, or A1. All data, except for the arrayed numbers, begin in the fourteenth column. The first two records in the file are ignored and can be used for labelling, formatting, etc.

An annotated copy of a sample control file follows. Note that any annotation line that begins with a ! should not actually appear in the file. Only the numbered lines 1-39 should appear in a usable control file.

```

!
!
1This file is a sample control file for T_CONTOUR
2 5678901234567890 IS F11.4 A1
3MARK      +0000      !Only used for debugging: places marks on conts
4IBW       +0001      !Should be one: in future will disable segments...
5MESH      +0004      !sub-grid scale for smoothing (1-9) 4 is good
!          !consumes program space: see restrictions
6LOGFAC    +0000      !Base ten logarithmic factor applied to data
7NNC16     +0004      !Maximum of contours that can be plotted/16
!          !consumes program space: see restrictions
8CLABFRQ   +0002      !Every CLABFRQ contour will be labelled
9CINT      +00200.0000 !Contour interval: if neg then zero cont omitted
10ODDMAX    +04000.0000 !Only every other cont over ODDMAX plotted
!          !Ignored if ODDMAX is zero
11CONLOW    -00500.0000 !The lowest contour that can be plotted
12CONHIGH   +04000.0000 !The highest contour that can be plotted
13FLAT      +00000.0000 !Flat region contour supressing param (0.0-1.0)
!          !if zero then no supression
!          !if one then most contours are supressed
14HILOTHR   +00050.0000 !Only extrmemums that are HILOTHR different
!          !than the nearest contour value are plotted
15BYTEL     L          !Character plotted at minumums
16BYTEH     H          !Character plotted at maximums
17HTCONTL   +00020.0000 !Height of contour labels
18HTHILOL   +00020.0000 !Height of extremum value labels
19HTBYTEL   +00020.0000 !Height of extremum type (max, min) labels
19.5NDCONT  +0000      !Number of digits after decimal in cont labels
!          !Set to +0360 for wind dir format (000-360)
20NDHILO    +0000      !Number of digits after dec in extremum labels
!          !Set to +0360 for wind dir format (000-360)
21NEXTCOL   +0015      !Color of extremum value labels

```

```

22NHILOCOL +0015      !Color of extremum type (max, min) labels
23NLABCOL  +0015      !Unused
24IPRECLB  +0002      !Precision of text used in labeling: usu two
25IBEGSEG  +0003      !Unused
26EPS      .0000177   !A small uncommon number: Note format
!          !Used to adjust contours slightly
27MAXERRS  +0250      !Max num of contouring errors before error exit
!
!The CONT array below contains thirty contour level thresholds at which
!line color and styles can be changed according to the STYL and COLR
!arrays. Thus, in this example, the 2800 contour will use the 25th value
!in the STYL and COLR arrays to choose line style and color
!This array must be arranged in ascending order
28 CONT1   -00100.0000 +00000.0000 +00050.0000 +00100.0000 +00150.0000
29 CONT2   +00200.0000 +00250.0000 +00300.0000 +00350.0000 +00400.0000
30 CONT3   +00450.0000 +00500.0000 +00800.0000 +01000.0000 +01200.0000
31 CONT4   +01400.0000 +01600.0000 +01800.0000 +02000.0000 +02200.0000
32 CONT5   +02800.0000 +03000.0000 +03200.0000 +03400.0000 +03600.0000
33 CONT6   +03800.0000 +04000.0000 +04200.0000 +04400.0000 +04600.0000
!The STYL and COLR arrays correspond to the CONT values
!Thus the contours between the nth and n+1th CONT values are drawn with
!the nth color and style (The 2800 contour would be in style=0,color=35)
34 STYL1   +0001 +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0001 +0001
35 STYL2   +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0000
36 STYL3   +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0000 +0000
37 COLR1   +0021 +0022 +0023 +0024 +0025 +0026 +0007 +0028 +0029 +0030
38 COLR2   +0031 +0032 +0033 +0034 +0035 +0036 +0037 +0038 +0039 +0040
39 COLR3   +0041 +0042 +0043 +0044 +0045 +0046 +0047 +0048 +0049 +0050
!
!      End of control file
!
OUTPUT:      T_CONTOUR produces a contour plot in the graphics
              area of the screen and messages about the plot status
              in the dialog area

ACCESS:      The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: /T_CONTOUR_SCREEN/ Contains 4 integers. The first two are
                                the x,y location of the lower left hand
                                corner of the plot. The next two
                                numbers are the width and height of the
                                plot
              /T_CONTOUR_FIELD/  The data array to be contoured is
                                passed in this block. This block must
                                contain (NX+2)*(NY+2) four byte
                                floating point numbers. This is
                                for extrapolation beyond the data
                                boundaries that is performed. The data
                                should be sent in a contiguous form with
                                no gaps. It should not be centered in
                                the array. It is recommended that it be
                                passed in a linear array with extra
                                space at the end. T_CONTOUR will take
                                care of centering in the array.

SIDE EFFECTS: Program execution may halt if passed array sizes don't
              agree with the passed sizes in NX, NY and NC16, or if

```

there is no routine T_CONTOUR_INOUT linked to the image.

All possible types of errors have not been examined. While there is some error checking, passing unreasonable values in the control file, or the call arguments can cause the program to make bad plots and possibly halt.

RESTRICTIONS: Data values that are very close to contour values will cause occasional errors in contouring.

METHOD: The array is searched for contours and they are traced to completion. Data values are sometimes altered if they are very near contour values to prevent endless spiraling of contours. A bit mask of contours that have passed through particular gridpoints is used to prevent redrawing of contours. Cubic spline interpolation is used to calculate a subgrid scale in order to create smoother contours.

Data is passed through common block /T_CONTOUR_FIELD/ and the control file with a logical name of CONTOURL and through calling arguments.

Several internal subroutines, entries and functions, T_CONTOUR_DRAW_I, T_CONTOUR_DRAW_C, T_CONTOUR_EXTRPL, T_CONTOUR_EXTRPL_FNC, T_CONTOUR_INT_I, T_CONTOUR_INTNEW, T_CONTOUR_INTOLD, T_NUMCHAR, and T_CONTOUR_SRCHDIR, T_C_SET_IC, T_C_SET_IG, T_C_SET_SC, T_C_SET_TC, and T_C_SET_CM are called to perform contour drawing, extrapolation, interpolation, contour building, formatting, masking, and searching

T_CONTOUR_INOUT is called to test for map boundaries

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY:	Created	1984 by Joshua Wurman
		from old version at MIT
	Modified	1985 by Joshua Wurman
		Extensive modifications to
		substitute MACRO routines
		for low level functions
		enhance speed and reliability

TYPE: SUBROUTINE

NAME: T_CONT240

PURPOSE: To contour arrays and send output to a VT240
emulating a Tektronix

DESCRIPTION: See documentation on T_CONTOUR for further
description

CALLING SEQUENCE: CALL T_CONT240 (see T_CONTOUR for arguments)

METHOD: Calls T_LINE240 to draw lines

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1985 by Joshua Wurman

TYPE: SUBROUTINES, ENTRIES, FUNCTION

NAME: T_CONTOUR_DRAW entries: T_CONTOUR_DRAW_I
T_CONTOUR_DRAW_C

T_CONTOUR_EXTRPL function: T_CONTOUR_EXTRPL_FNC

T_CONTOUR_INT entries: T_CONTOUR_INT_I
T_CONTOUR_INTNEW
T_CONTOUR_INTOLD

T_CONTOUR_SRCHDIR

T_NUMCHR

PURPOSE: These routines are called by T CONTOUR to
plot arrays. It is unlikely that they
would ever be called by another routine.
See the source code for documentation.
They are included in the T_CONTOUR source file.

LANGUAGE: VAX-11 FORTRAN

TYPE: SUBROUTINE, ENTRIES

NAME: T_C_SET entries: T_C_SET_IC
 T_C_SET_IG
 T_C_SET_SC
 T_C_SET_TC
 T_C_SET_CM

PURPOSE: These routines are called by T CONTOUR to plot arrays. It is unlikely that they would ever be called by another routine. Documentation is included in the source code. They are contained in the file TCONTMAC source code file.

LANGUAGE: VAX-11 MACRO

TYPE: SUBROUTINE

NAME: T_DACHAR

PURPOSE: To set the dialog area characters per line

DESCRIPTION: Sets the dialog area characters per line to the specified value

CALLING SEQUENCE: CALL T_DACHAR(CHAR_PER_LINE)

CHAR_PER_LINE: The number of characters per line

INPUT: none

OUTPUT: Calls T_OUT, T_INCOD, AND T_DAVIS send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Makes the dialog area visible

RESTRICTIONS: none

METHOD: T_OUT and T_INCOD are called to specify the characters per line. T_DAVIS is called with an argument of 1 in order to reset the dialog area and make the changes effective.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_DAIN

PURPOSE: Changes the color of the text and background in the dialog area

DESCRIPTION: Sets the foreground, background and erase indices of the dialog area.

CALLING SEQUENCE: CALL T_DAIN(FORE_COL, BACK_COL, ERASE_COL)

FORE_COL: Integer containing the color index of the text in the dialog area

BACK_COL: Integer containing the color index of the dialog area background

ERASE_COL: Integer containing the color index in which characters are erased in the dialog area

INPUT: none

OUTPUT: Calls T_OUT, T_INCOD, and T_DAVIS to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Makes the dialog area visible

RESTRICTIONS: none

METHOD: Calls T_OUT and T_INCOD to set the dialog area colors and then calls T_DAIN with an argument of 1 to reset the dialog area and make the changes effective

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_DALIN

PURPOSE: To set the number of lines in the dialog area

DESCRIPTION: Sets the number of lines in the dialog area to a specified value

CALLING SEQUENCE: CALL T_DAPOS(NUMBER_OF_LINES)

NUMBER_OF_LINES: Integer containing the
number of dialog area lines

INPUT: none

OUTPUT: Calls T_OUT, T_INCOD, and T_DAVIS send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Makes the dialog area visible

RESTRICTIONS: none

METHOD: T_OUT and T_INCOD are called to specify the number of dialog area lines. T_DAVIS is called with an argument of 1 in order to reset the dialog area and make the changes effective.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_DAPOS

PURPOSE: To set the position of the dialog area on the screen

DESCRIPTION: Sets the lower left hand corner of the dialog area to a specified location in screen coordinates

CALLING SEQUENCE: CALL T_DAPOS(X_POSIT, Y_POSIT)

X_POSIT: Integers containing the x and y position,
Y_POSIT: in screen coordinates, of the lower
left hand corner of the dialog area

INPUT: none

OUTPUT: Calls T_OUT, T_XYCOD, and T_DAVIS send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Makes the dialog area visible

RESTRICTIONS: none

METHOD: T_OUT and T_XYCOD are called to specify the position of the dialog area. T_DAVIS is called with an argument of 1 in order to reset the dialog area and make the changes effective.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_DAVIS

PURPOSE: To make the dialog area visible or invisible

DESCRIPTION: Sets the dialog area visibility to the specified value

CALLING SEQUENCE: CALL T_DAVIS (VISIBILITY)

VISIBILITY: Integer containing a 1 to set the dialog area visible or a 0 to set dialog area invisible

INPUT: none

OUTPUT: Calls T_OUT, and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: If the dialog area is made visible, all pending changes to the dialog area parameters are made effective.

RESTRICTIONS: none

METHOD: T_OUT and T_INCOD are called to specify the number of dialog area lines.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_END

PURPOSE: Terminates plotting

DESCRIPTION: This routine sends all pending output to the device that is receiving plots and then either deassigns the I/O channel to the terminal or closes the plot file.

CALLING SEQUENCE: CALL T_END

INPUT: none

OUTPUT: Calls T_OUTNOW to cause all pending output to be sent

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: /T_CONTOUR CHAN/ which is initialized in T_BEG
only the third byte is used by this subroutine

SIDE EFFECTS: If an error occurs during the deassignment of the I/O channel, program execution stops.

RESTRICTIONS: none

METHOD: The third byte in /CHAN/ is tested. If it is .TRUE., the system service DASSGN is called to deassign the I/O channel to the terminal. If it is .FALSE., then the plot file is closed and saved.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE
 NAME: T_ESEG
 PURPOSE: Closes the current segment
 DESCRIPTION: Closes the segment that is currently open for definition
 CALLING SEQUENCE: CALL T_ESEG
 INPUT: none
 OUTPUT: Calls T_OUT to send appropriate sequence to terminal
 ACCESS: The calling program must be linked to LIB:TKLIB.OLB
 COMMON BLOCKS: none
 SIDE EFFECTS: none
 RESTRICTIONS: none
 METHOD: Sends "close segment" command to the terminal
 by calling T_OUT
 LANGUAGE: VAX-11 FORTRAN
 MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE
 NAME: T_GBCLR
 PURPOSE: Changes the screen background color
 DESCRIPTION: Sets the graphics background color to the specified color
 CALLING SEQUENCE: CALL T_GBCLR(HUE , LIGHTNESS , SATURATION)
 INPUT: none
 OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal
 ACCESS: The calling program must be linked to LIB:TKLIB.OLB
 COMMON BLOCKS: none
 SIDE EFFECTS: none
 RESTRICTIONS: none
 METHOD: Sends a "change background color" command with a call to T_OUT and then sends the three color parameters with subsequent calls to T_INCOD
 LANGUAGE: VAX-11 FORTRAN
 MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_INCOD

PURPOSE: Sends encoded integers to the terminal

DESCRIPTION: Encodes an integer into a one to three byte sequence and sends the code to the terminal

CALLING SEQUENCE: CALL T_INCOD(INTEGER)

INTEGER: Integer containing the integer to be encoded and sent to the terminal

INPUT: none

OUTPUT: Calls T_OUT times to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: Only integers in the range -32768 to +32767 inclusive will be encoded correctly in this routine.

METHOD: INTEGER is encoded according to the rules described in the Tektronix 4110 Series Command Reference manual. Integers with magnitudes less than 16 are sent as one byte; integers with magnitudes between 16 and 1023, inclusive, are sent as two bytes; integers with magnitudes greater than 1023 are sent as three bytes. T_OUT is called to send the correct sequence.

LANGUAGE: VAX-11 MACRO

MODIFICATION HISTORY: Created 7-Aug-1985 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_KSEG

PURPOSE: To erase segments permanently

DESCRIPTION: Deletes the specified segments from screen memory, making them permanently invisible and freeing screen memory for future segments

CALLING SEQUENCE: CALL T_KSEG (SEGMENT_NUMBER)

SEGMENT_NUMBER: Integer containing the number of the segment that is to be deleted. Note that if a -1 is passed, all segments will be erased.

INPUT: none

OUTPUT: T_INCOD and T_OUT are called to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_OUT and T_INCOD to send a "kill segment" command to the terminal

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_LCHAR

PURPOSE: To make dialog area text small

DESCRIPTION: Sets the alpha text writing mode to small

CALLING SEQUENCE: CALL T_LCHAR

INPUT: none

OUTPUT: Calls T_OUT and T_DAVIS to send appropriate sequence to terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Makes the dialog area visible
Empties buffer of all pending plot output .

RESTRICTIONS: none

METHOD: Calls T_OUT with a second parameter of -2 in order to send a two character sequence to the terminal immediately. T_DAVIS is called with an argument of one in order to cause an immediate effect on the text size.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman
Modified 9-Mar-1985 by Joshua Wurman
sends sequence through T_OUT with a
negative length for immediate output

TYPE: SUBROUTINE

NAME: T_LINE

PURPOSE: To draw a line on the terminal

DESCRIPTION: Connects a sequence of points, specified with (x,y) pairs, on the terminal

CALLING SEQUENCE: CALL T_LINE (NUMBER_OF_POINTS , X_ARRAY , Y_ARRAY)

NUMBER_OF_POINTS: Integer containing the number of points to be connected

X_ARRAY: Integer arrays containing the x and y coordinates of the points to be connected

Y_ARRAY: The points should be in one to one correspondence

INPUT: none

OUTPUT: Calls T_OUT to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Program execution may halt if an attempt is made to connect more than 1000 points in one call to this routine.

The terminal is left in alpha mode.

RESTRICTIONS: The maximum number of points that can be connected during one call to this routine is 1000. This limit is arbitrary and has been chosen to balance utility and use of space.

METHOD: Since the number of characters that can be sent in one output request is limited by factors that vary from machine to machine and from time to time, this routine sends a series of separate line draw requests. The number of requests is dependent on the maximum number of characters that can be sent at one time and the number of points to be connected. Currently the former quantity is explicitly set by a parameter statement in the routine.

To formulate each line draw request, the routine puts an "enter vector mode" request at the beginning of a buffer. Then it loops through the points, encoding them in a two to five byte format according to the conventions specified in the Tektronix 4110 Command Reference guide, and adds the codes to the buffer. (The variable length coding takes advantage of the fact that, if the highest or lowest order bits of the location of a point just drawn are the same as those of the current point, then those higher or lower order bits don't have to be sent for the current point.) This continues until the points are exhausted or the buffer reaches the maximum length that can be sent

with one output request. At that time an "enter vector mode" request is added to the buffer and T_OUT is called to send the buffer to the terminal. If more points remain then the process is repeated as necessary.

LANGUAGE: VAX-11 MACRO

MODIFICATION HISTORY: Created 1985 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_LNIND

PURPOSE: To change line color

DESCRIPTION: Sets the color in which future lines will be drawn
Does not affect lines already on the screen or in memory

CALLING SEQUENCE: CALL T_LNIND (LINE_COLOR)

LINE_COLOR: Integer containing the line drawing color

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends a "set line index" command with a call to T_OUT and the specified line drawing color with a call to T_INCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_LNSTY

PURPOSE: To change line drawing style

DESCRIPTION: Sets the style in which future lines will be drawn
Does not affect lines already on the screen or in memory

CALLING SEQUENCE: CALL T_LNIND (LINE_STYLE)

LINE_STYLE: Integer containing the line drawing style

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends a "set line style" command with a call to T_OUT and the specified line drawing style with a call to T_INCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE
 NAME: T_MARK
 PURPOSE: To plot symbols
 DESCRIPTION: Plots a specified number of markers in specified colors and locations
 CALLING SEQUENCE: CALL T_MARK (X_ARRAY , Y_ARRAY , NUMBER , TYPE , COLOR)
 X_ARRAY: Integer arrays containing the x,y locations
 Y_ARRAY: of each symbol to be plotted
 NUMBER: Integer containing the number of symbols to be plotted
 TYPE: Integer containing the number code for the type of symbol to be plotted
 COLOR: Integer containing the color in which the symbols are to be plotted
 INPUT: none
 OUTPUT: Calls T_OUT, T_LNIND, and T_XYCOD to send appropriate sequences to the terminal
 ACCESS: The calling program must be linked to LIBT:TKLIB.OLB
 COMMON BLOCKS: none
 SIDE EFFECTS: Changes the line drawing color to the color specified for the plotted markers.
 The terminal is left in alpha mode.
 RESTRICTIONS: none
 METHOD: This routine first sets the current marker plotting type with a calls to T_OUT and T_INCOD. Then the color of the markers is set with a call to T_LNIND which, in addition to setting the line color, sets the marker color. Then the terminal is sent into marker plotting mode with a call to T_MMODE. Each x,y location passed in the X_LOCATION and Y_LOCATION arrays is encoded and sent to the terminal with calls to T_XYCOD. Finally, the terminal is set to alpha mode with a call to T_OUT.
 LANGUAGE: VAX-11 FORTRAN
 MODIFICATION HISTORY: Created 1984 by Joshua Wurman
 Modified 7-Aug-1985 by Joshua Wurman
 calls T_MMODE to enter marker mode

TYPE: SUBROUTINE

NAME: T_MMODE

PURPOSE: To set a Tektronix terminal to marker mode

DESCRIPTION: This subroutine will set a Tektronix terminal to marker mode. The terminal mode is changed immediately.

CALLING SEQUENCE: CALL T_MMODE

INPUT: none

OUTPUT: Calls T_OUT to send appropriate sequence to terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: All pending plotting output being stored by T_OUT will be sent to the terminal.

RESTRICTIONS: none

METHOD: An ASCII 28 is sent to the terminal with a call to T_OUT. The output is forced to be immediate by using a negative output length specifier.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 7-Aug-1985 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_NUMCHR

PURPOSE: Called by T_CONTOUR and T_AXES to plot arrays and draw axes. It encodes numbers into character format. It has not been tested outside of the limited use in the T_CONTOUR and T_AXES calls and is thus not documented here. See the T_CONTOUR source code for further documentation.

LANGUAGE: VAX-11 FORTRAN

TYPE: SUBROUTINE

NAME: T_MOVE

PURPOSE: To move the cursor without drawing a line

DESCRIPTION: Moves the beam location to the specified position
in a "pen up" mode

CALLING SEQUENCE: CALL T_MOVE (X_LOCATION , Y_LOCATION)

X_LOCATION: Integers containing x,y location
Y_LOCATION: of the target location

INPUT: none

OUTPUT: Calls T_OUT and T_XYCOD to send appropriate sequences to
the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends an explicit "move" command to the terminal with
calls to T_OUT and T_XYCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE
 NAME: T_OG
 PURPOSE: To send output
 DESCRIPTION: Sends output to the terminal or to the plot file
 CALLING SEQUENCE: CALL T_OG (BYTES_OF_OUTPUT)
 BYTES_OF_OUTPUT: Integer containing the number
 of bytes to be sent
 INPUT: none
 OUTPUT: Sends plot data to the terminal or to a file
 ACCESS: The calling program must be linked to LIB:TKLIB.OLB
 COMMON BLOCKS: /T_COMMON_BUF/ contains the output buffer
 /T_COMMON_CHAN/ contains a two byte integer which
 contains either the channel number assigned to the
 terminal or a 50 which is the logical unit number
 associated with the file that is opened. A third byte
 contains either a .TRUE. if an I/O channel was opened
 to the terminal or a .FALSE. if a file was opened.
 SIDE EFFECTS: If an error occurs during the QIO to the terminal,
 program execution will halt
 RESTRICTIONS: none
 METHOD: If the integer in /T_CONTOUR_CHAN/ is .TRUE. then
 a QIO is sent to the terminal to write the buffer
 in /T_CONTOUR_BUF/, otherwise the buffer is written
 to the file using a write statement.
 LANGUAGE: VAX-11 FORTRAN
 MODIFICATION HISTORY: Created 1984 by Joshua Wurman
 Modified 1985 by Joshua Wurman
 --writes files with 80 byte records if
 PLOTIO is pointed to a file--but, this
 option is not debugged yet
 --renamed common blocks

TYPE: SUBROUTINE

NAME: T_OUT

PURPOSE: To send output

DESCRIPTION: T_OUT decides whether to add plot output to a buffer, or to send it output to a device. The decision is based on several factors:

- If the output device is the user's terminal, then all output is sent immediately.
- If the output length is passed as a negative value, all current and stored output is sent immediately
- If the output length is passed as a zero, all data currently in the buffer is sent immediately
- If the buffer is full, then the output is sent immediately.
- Otherwise, the output is appended to the buffer.

CALLING SEQUENCE: CALL T_OUT (OUTPUT , OUTPUT_LENGTH)

OUTPUT: Character variable containing the output to be sent

OUTPUT_LENGTH: Integer containing :
 --the number of characters to be
 if buffered output allowed
 --the negative of the number of
 characters to be output if all
 current and pending output is to
 be sent
 --zero if all pending output is to
 be sent

INPUT: none

OUTPUT: Calls T_OG to send output if output is to be sent

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: /T_COMMON_BUF/ contains the output buffer and is shared with T_OG

/T_COMMON_CHAN/ contains a two byte integer which is ignored by T_OUT and a third byte which is .TRUE. if an I/O channel is opened to the terminal or a .FALSE. if a file is open

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: If the output device is the terminal (ITT=.TRUE.) then the output buffer is filled with the input characters and T_OG is called.

Otherwise, If the output length is passed as zero then T_OG is called to send the pending buffer

Otherwise, If the output length is negative, then the output is appended to the buffer and T_OG is called to send it, unless the append action would overflow the buffer, in which case T_OG is called to send the pending buffer and again after the current output is placed in the buffer

Otherwise, the output is appended to the buffer, unless the append action would overflow the buffer, in which case T_OG is called to send the pending buffer and the current output is placed at the beginning of the buffer

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman
Modified 1985 by Joshua Wurman
--calls T_OG instead of old T_O
--renamed common blocks

TYPE: SUBROUTINE

NAME: T_OUTNOW

PURPOSE: To send all pending output

DESCRIPTION: This is the routine that programmers should use to finish plots etc. It causes the pending output buffer to be sent to the output device. If all plotting is to be ended, T_END should be called instead.

CALLING SEQUENCE: CALL T_OUTNOW

INPUT: none

OUTPUT: Calls T_OUT to send all pending output

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_OUT with a length argument of zero to force all pending output

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE
NAME: T_PANEL
PURPOSE: Draws a filled polygon
DESCRIPTION: Draws a panel with the specified boundries and filling color, with or without drawing the panel boundary
CALLING SEQUENCE: CALL T_PANEL (X_ARRAY , Y_ARRAY , NUMB_OF_VERTICES ,
FILLING_COLOR , BOUNDARY_DRAW_FLAG)

X_ARRAY: Integer arrays containing the x,y locations
Y_ARRAY: of the vertices of the panel to be drawn.
Note: the first vertex should be repeated in the last x,y pair

NUMB_OF_VERTICES: Integer containing the number of points sent in X_ARRAY and Y_ARRAY
This should be one more than the number of vertices in the polygon

FILLING_COLOR: Integer containing a code to specify how the polygon is to be filled
A negative number causes the panel to be filled with the color corresponding to the absolute value of the specified filling color. A positive number causes the panel to be filled with a pre-defined pattern

BOUNDARY_DRAW_FLAG: Integer containing a one if the boundary of the polygon is to be drawn and a zero otherwise

INPUT: none
OUTPUT: Calls T_PNCLR, T_VECT, T_OUT, T_XYCOD, T_INCOD, and T_ALPHA to send appropriate sequences to the terminal
ACCESS: The calling program must be linked to LIBT:TKLIB.OLB
COMMON BLOCKS: none
SIDE EFFECTS: The terminal is left in alpha mode
RESTRICTIONS: none
METHOD: T_PNCLR is called to set the panel filling color. T_VECT is called to set the terminal to vector mode. T_OUT, T_XYCOD, and T_INCOD are called to begin the panel. All the passed points are sent to T_XYCOD to be sent to the terminal. T_OUT is called to end the panel and T_ALPHA is called to set the terminal to alpha mode.
LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_PNCLR

PURPOSE: To set the panel filling color

DESCRIPTION: Sets the panel filling color or style

CALLING SEQUENCE: CALL T_PNCLR (COLOR)

COLOR: Integer containinig the filling color or style of future panels

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_OUT to send a "set fill pattern" command to the terminal and then calls T_INCOD to send the fill pattern

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_PREC

PURPOSE: To enable low or high precision text writing in the graphics area

DESCRIPTION: Sets the graphtext precision to string or stroke precision

CALLING SEQUENCE: CALL T_PREC (PRECISION)

PRECISION: Integer containing a one if string precision is desired or a two if stroke precision is desired.

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_TOUT and T_INCOD to send a "set graphtext precision" command to the terminal with the specified parameter

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_PRINT

PURPOSE: To print the screen

DESCRIPTION: Causes a hardcopy of the screen to be produced with either a positive or negative background

CALLING SEQUENCE: CALL T_PRINT (BACKGROUND_CODE)

BACKGROUND_CODE: Integer containing a zero or a one if a normal hardcopy is desired and a two if a reversed background copy is desired

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal which, in turn causes a hardcopy to be produced

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends a "hardcopy" command with the appropriate parameter with calls to T_OUT and T_INCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_PSEG

PURPOSE: To move objects on the screen

DESCRIPTION: This routine will move a specified segment's pivot point to the specified location.

CALLING SEQUENCE: CALL T_PSEG (SEGMENT_NUMBER , X_LOCATION , Y_LOCATION)

SEGMENT_NUMBER: Integer containing the number of the segment to be moved

X_LOCATION: Integers containing the x,y location

Y_LOCATION: to which the segment is to be moved

INPUT: none

OUTPUT: Calls T_OUT, T_INCOD, and T_XYCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends a "set segment position" command to the terminal with calls to T_OUT, T_INCOD, and T_XYCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_RECOT

PURPOSE: To encode real numbers and send them to the terminal

DESCRIPTION: Encodes a specified real number into valid mantissa and exponent integers that can be sent to the terminal

CALLING SEQUENCE: CALL T_RECOT (REAL_NUMBER)

REAL_NUMBER: Four byte real number containing the number to be sent to the terminal

INPUT: none

OUTPUT: Calls T_INCOD to send the mantissa and exponent to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: This routine uses a scheme that closely parallels that described in the Tektronix 4110 Command Reference guide for encoding real numbers. The real number is broken down into a base-two integer mantissa and exponent and then both of these are sent to the terminal with calls to T_INCOD.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_RFRSH

PURPOSE: Clears the screen

DESCRIPTION: This routine will clear the screen of all graphical objects that are not stored in segments

CALLING SEQUENCE: CALL T_RFRSH

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_OUT to send a "renew view" command to the terminal and calls T_INCOD to send an argument of zero

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman
Modified 7-Aug-1985 by Joshua Wurman
sends an argument of zero to specify
the current view

TYPE: SUBROUTINE

NAME: T_ROT

PURPOSE: Sets the text rotation angle

DESCRIPTION: Sets the graphtext rotation angle for future graphtext output

CALLING SEQUENCE: CALL T_ROT (ANGLE)

ANGLE: Four byte floating point number containing the angle, in degrees, that future graphtext should be rotated

INPUT: none

OUTPUT: Calls T_OUT and T_RECOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_OUT to send a "set graphtext rotation" command and T_RECOD to send the rotation angle

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_SCHAR

PURPOSE: To make dialog area text large

DESCRIPTION: Sets the alpha text writing mode to large

CALLING SEQUENCE: CALL T_SCHAR

INPUT: none

OUTPUT: Calls T_OUT and T_DAVIS to send appropriate sequence to terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Makes the dialog area visible
Empties buffer of all pending plot output

RESTRICTIONS: none

METHOD: Calls T_OUT with a second parameter of -2 in order to send a two character sequence to the terminal immediately. T_DAVIS is called with an argument of one in order to cause an immediate effect on the text size.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman
Modified 20-Mar-1985 by Joshua Wurman
sends sequence through T_OUT with a negative length for immediate output

TYPE: SUBROUTINE
 NAME: T_STRING
 PURPOSE: To plot strings of characters
 DESCRIPTION: This routine will plot character strings of specified height, color, rotation, and precision at specified locations.
 CALLING SEQUENCE: CALL T_STRNG (X_LOCATION , Y_LOCATION , HEIGHT , CHARACTER_STRING , ROTATION_ANGLE , NUMBER_OF_CHAR , PRECISION , COLOR)
 X_LOCATION: Integers containing the x,y location
 Y_LOCATION: of the lower left corner of the string
 HEIGHT: Integers containing the height of the printed characters
 CHARACTER_STRING: Character variable containing the character string
 ROTATION_ANGLE: Four byte floating point number containing the angle in degrees that the string is to be rotated
 NUMBER_OF_CHAR: Integer containing the number of characters passed in CHARACTER_STRING
 PRECISION: Integer containing a one for string precision characters and a two for stroke precision characters
 COLOR: Integer containing the color index of the characters
 INPUT: none
 OUTPUT: Calls T_VECT, T_MOVE, T_PREC, T_TSIZ, T_ROT, T_TXCLR, T_OUT, T_INCOD, and T_ALPHA to send appropriate sequences to the terminal
 ACCESS: The calling program must be linked to LIB:TKLIB.OLB
 COMMON BLOCKS: none
 SIDE EFFECTS: Leaves the terminal in alpha mode
 RESTRICTIONS: none
 METHOD: The active position is moved to the specified location with a call to T_MOVE, the text attributes are set with calls to T_PREC, T_TSIZ, T_ROT, and T_TXCLR, and then the character string is sent to the terminal using T_OUT.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created

1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_TBCLR

PURPOSE: To set the string precision text background and the color in dashed line gaps

DESCRIPTION: This will set the background that appears behind characters sent in string precision mode. It will also set the color that is drawn in the gaps of dashed lines.

CALLING SEQUENCE: CALL T_TBCLR (TEXT_BACKGROUND_COLOR ,
DASHED_LINE_GAP_COLOR)

TEXT_BACKGROUND_COLOR: Integer containing
the color index to be
displayed behind string
precision text

DASHED_LINE_GAP_COLOR: Integer containing
the color index to be
displayed in the gaps
of dashed lines

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBF:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: This sends a "set background indices" command with calls to T_OUT. The parameters are sent with calls to T_INCOD.

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

```

TYPE:                SUBROUTINE

NAME:                T_TSEG

PURPOSE:            To move and modify segments

DESCRIPTION:        This will move, rotate and scale segments

CALLING SEQUENCE:   CALL T_TSEG ( SEGMENT_NUMBER , X_SCALE , Y_SCALE
                                ROTATION_ANGLE , X_LOCAT , Y_LOCAT )

                                SEGMENT_NUMBER:  Integer containing the number
                                                the segment to be altered

                                X_SCALE:         Four byte floating point numbers containing
                                Y_SCALE:         the x and y scaling factors    Numbers
                                                greater than one stretch the segment,
                                                numbers less one compress it.

                                ROTATION_ANGLE:  Four byte floating poing number
                                                containing the angle through which
                                                the segment is to be rotated

                                X_LOCAT:         Integers containing the x and y location
                                Y_LOCAT:         to which the pivot point of the segment
                                                is to be moved

INPUT:              none

OUTPUT:             Calls T_OUT, T_INCOD, T_RECOC, and T_XYCOD to send
                    appropriate sequences to the terminal

ACCESS:             The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS:      none

SIDE EFFECTS:       none

RESTRICTIONS:       none

METHOD:             Sends a "set segment image transform" command to the
                    terminal will calls to T_OUT, T_INCOD, T_RECOC, and
                    T_XYCOD

LANGUAGE:           VAX-11 FORTRAN

MODIFICATION HISTORY:  Created                1984 by Joshua Wurman

```

TYPE: SUBROUTINE

NAME: T_TSIZ

PURPOSE: To set the graphtext size

DESCRIPTION: Sets the graphtext height, width, and spacing according to a passed height value

CALLING SEQUENCE: CALL T_TSIZ(CHARACTER_HEIGHT)

CHARACTER_HEIGHT: Integer containing the height of future graphtext characters
The width will be set to 4/5 of the height and the spacing between characters will be set to 1/5 of the height.

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Calls T_OUT and T_INCOD to send a "set graphtext size" command with parameters of 4/5, 1, and 1/5 of CHARACTER_HEIGHT

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_TXCLR

PURPOSE: To set text colors

DESCRIPTION: This will set the color index for future alphatext and
graphtext

CALLING SEQUENCE: CALL T_TXCLR (COLOR)

COLOR: Integer containing the color index of future
text

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to
the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends a "set text index" command with calls to T_OUT
and T_INCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_VECT

PURPOSE: To set the terminal to vector mode

DESCRIPTION: This will set and leave the terminal in vector mode

CALLING SEQUENCE: CALL T_VECT

INPUT: none

OUTPUT: Calls T_OUT to send appropriate character to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends an ASCII 29 (decimal) to the terminal with
a call to T_OUT

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_VSEG

PURPOSE: To make segments visible and invisible

DESCRIPTION: This will set a segment's visibility to on or off

CALLING SEQUENCE: CALL T_VSEG (SEGMENT_NUMBER , VISIBILITY)

SEGMENT_NUMBER: Integer containing the number of
the segment to be made visible or
invisible

VISIBILITY: Integer containing a zero if the segment
is to be invisible or a one if the
segment is to be visible

INPUT: none

OUTPUT: Calls T_OUT and T_INCOD to send appropriate sequences to
the terminal

ACCESS: The calling program must be linked to LIB:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: Sends a "set segment visibility" command with calls to
T_OUT and T_INCOD

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created 1984 by Joshua Wurman

TYPE: SUBROUTINE

NAME: T_XYCOD

PURPOSE: To send a location to the terminal

DESCRIPTION: Sends an encoded x,y location to the terminal

CALLING SEQUENCE: CALL T_XYCOD (X_LOCATION , Y_LOCATION)

X_LOCATION: Integers containing the x,y
Y_LOCATION: coordinates of a point to be
sent to the terminal

INPUT: none

OUTPUT: Calls T_OUT to send the encoded location to the terminal

ACCESS: The calling program must be linked to LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: none

RESTRICTIONS: none

METHOD: This routine encodes the x,y location into a string of five ASCII characters according to the rules outlined in the Tektronix 4110 Command Reference guide and sends the five characters with T_OUT

LANGUAGE: VAX-11 MACRO

MODIFICATION HISTORY: Created 1985 by Joshua Wurman

TYPE: SUBROUTINE

```
NAME:          T_AXES      entries: T_AXES_GRAPH
                                   T_AXES_GXFRM
```

PURPOSE: To draw labelled axes

DESCRIPTION: Subroutine T AXES is useful for plotting a rectangle with labelled axes to surround the contour map. It can also be used to plot axes for drawing graphs and scatter diagrams etc.

CALLING SEQUENCE: CALL T AXES (argument list shown below)

```

RX1      Minimum X value - left-hand side of X axis
RX2      Maximum X value - right-hand side
RDX      Step size between labelled X values
XFMT     Format string to use for X values
        This must include surrounding parentheses,
        and end with a zero byte (i.e., it is an
        ASCII zero string)
        For example - '(F4.2)' or '(I2)'
        ** First Special Case - if the string starts
           with an 'L' rather than '(' then the
           numbers RX1 etc. are treated as logs to
           the base 10, and 10**RX1 etc. are plotted
           out as the labels
        ** Second Special Case - if the string is
           just '(YM)' then RX1 must be a first year
           and month (e.g., 8204) and RX2 must be a
           final year and month (e.g., 8302). The
           axis will be labelled with APR, MAY, etc.
NTX      Number of ticks in X per labelled value
        (If NTX=1, only labelled values are ticked)
LDX      A logical variable which is .TRUE. if the
        labelled values should have leading zeroes
        plotted
WIDTH    The width in pixels
        of the base of the rectangle - i.e., the
        distance from RX1 to RX2. The bottom left
        corner of the rectangle will not be at the
        origin - it will be shifted in and up an
        appropriate distance to allow for the
        axis labelling
XLAB     Label for the X axis - an ASCII zero string

RY1      Minimum Y value - bottom of Y axis
RY2      Maximum X value - top of Y axis
RDY      Step size between labelled Y values
YFMT     Format string to use for Y values
        This must include surrounding parentheses,
        and end with a zero byte (i.e., it is an
        ASCII zero string)
        For example - '(F4.2)' or '(I2)'
        ** First Special Case - if the string starts
           with an 'L' rather than '(' then the
           numbers RY1 etc. are treated as logs to

```

the base 10, and 10**RY1 etc. are plotted out as the labels

NTY Number of ticks in Y per labelled value
(If NTY=1, only labelled values are ticked)

LDY A logical variable which is .TRUE. if the labelled values should have leading zeroes plotted

HEIGHT The height in pixels of the rectangle - i.e., the distance from RY1 to RY2.

YLAB Label for the Y axis - an ASCII zero string

CHHT Height (pixels) of the characters used for the axis labels and numbers
This is also used to get an appropriate scale for the ticks etc.

GRID A logical variable - if .TRUE., a complete grid is drawn at the X and Y labelled values

TWOTIK A logical variable - if .TRUE., ticks are put on all 4 sides of the rectangle rather than just the bottom (X) and left (Y)

BSTY Axis and tick line style

BCOL Axis and tick line color

XCOL X axis label color

YCOL Y axis label color

IBSEG beginning segment number: axes and labels are placed in different segments IBSEG and IBSEG+1

IBW controls whether segments and color commands are made. If IBW=-1 then no segments and colors are made. This can be used for making plots on black and white terminals which do not support segment memory.

A sample call to T_AXES to simply plot X and Z each from 0 to 50 in steps of 10, with 10 ticks per label (so that the ticks are spaced one unit apart) is:

```
CALL T_AXES( 0.0,50.0,10.0,'(I2)',10,.FALSE.,2000.,'X',
1 -0.0,50.0,10.0,'(I2)',10,.FALSE.,2000.,'Y',
2 20.,.FALSE.,.TRUE.,1,0,1,1,1,0)
```

Note that the numbers labelling the axes are plotted in I2 format and do not have leading zeroes; the rectangle is actually a 2000 pixel square; the character height is 0.15 inch (a pretty good value); a grid is not plotted, but ticks are put on all sides of the box.

T_AXES has an entry point T_AXES_GXFRM which can be used to transform an (X,Y) value in the ordinate/abscissa space to (X,Y) plot co-ordinates. For example, CALL T_AXES_GXFRM(RX1,RY1,XBOT,YLEFT) will return in XBOT the plot co-ordinate of the base of the rectangle, and in YLEFT the plot co-ordinate of the left of the triangle. Clearly, by doing a series of such calls for one can obtain points to be joined to draw a graph within the rectangle. There is also an entry point T_AXES_GRAPH (see the source program for details).

In the special case of logarithmic values in X or Y, the input number is treated as a log value; in the special case of years and months in X, the input value must be 1 for the first month (left-hand side), incremented by 1 for each successive month.

INPUT: none

OUTPUT: Calls T_BSEG, T_ESEG, T_STRNG, and T_LINEM to
create output on the terminal

ACCESS: The calling subroutine must be linked with LIBT:TKLIB.OLB

COMMON BLOCKS: none

SIDE EFFECTS: Terminal may be left in alpha mode

RESTRICTIONS: none

METHOD: see source code

LANGUAGE: VAX-11 FORTRAN

MODIFICATION HISTORY: Created in antiquity at MIT or Australia
Modified 1984 by Joshua Wurman
modified MIT version for VAX and Tektronix
and colors and segments

END

12-86

DTIC